RSVP Review Status Sheet
Due in RSVP Project Office on January 14, 2004
RSVP Project Office

WBS No. 1.1 Title: RSVP Project Office **Date 01/14/05**

Preparer/Manager: Jon Kotcher **Current Cost Est. (FY05 $M) = 19.8**
Assigned Contingency % = 30%

Cost Elements (FY05$M): Matls. = 2.4; Effort = 6.1; Ohd. = 6.7; Conting. = 4.6; Total = 19.8

WBS Dictionary Definition: Level of Effort to support the RSVP Project Office. Positions supported are Project Manager, Deputy Project Manager, Project Engineer, Budget/Schedule personnel, a Procurement Officer (fraction) and Administrative Assistants. Areas supported include Safety, Quality Assurance, Document Control and Computing Support. Includes travel and supplies.

Technical Level of Confidence:	*Prototype* Demonstrated	__	*Elements* Built & Tested	__
(choose one)	Similar *system* exists	__	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	%	Engineered design	%
(by percentage of total cost;	Engineered conceptual	%	Scientist conceptual	%
sum of fractions a-f = 100%)	Guess	%	Other (specify)	100%

Status of Hardware/Software Development: This is a Level-of-Effort task for management of the RSVP Construction Project.

Issues (funding, collaborator shortage, engineering help, etc.) Most administrative personnel are on-board. Space and other charges at BNL are uncertain, because this is not a DOE project. Risk is standing-army costs if project schedule slides, and need for more project office personnel. We have reasonably estimated contingency at 30%.

DRAFT - RSVP Review Status Sheet - DRAFT
Due in RSVP Project Office on January 14, 2005
[Please fill in all items in red type]

WBS No. 1.2.1 Title: "Vacuum System" **Date 01/09/05**

Preparer/Manager: "Ralph Brown" **Current Cost Est. (FY05 $M) = 10.74**
Assigned Contingency % = 68.7%

Cost Elements (FY05$M): Matls. = 3.89; Effort = 2.48; Ohd. = xx.x; Conting. = 4.37; Total = 10.74

WBS Dictionary Definition: The KOPIO Detector decay volume and the Neutral Beam path upstream to the spoiler must be at high vacuum (10^{-7} Torr) in order to suppress background from neutron and K^0 interactions with residual gas. The upstream vacuum vessel and entering/exiting beam pipes must present on average 5% of a radiation length of low-Z material. The scope of this subsystem includes the engineering, design, fabrication, procurement and delivery to BNL of all hardware associated with the detector decay volume. This includes the upstream vacuum vessel and entering/exiting beam pipes, vacuum transitions, D4 vacuum box, downstream vacuum vessel, vacuum pumping stations and management activities. Although the neutral beam will be evacuated as part of the detector decay volume, all hardware for this area is part of the neutral beam subsystem.

Technical Level of Confidence: (choose one)

Prototype Demonstrated	__	*Elements* Built & Tested	__
Similar *system* exists	__	Similar *technology* works	__
Novel system concept	_X	No candidate concept yet	__
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost; sum of fractions a-f = 100%)

Commercial product	36%	Engineered design	0%
Engineered conceptual	64%	Scientist conceptual	0%
Guess	0%	Other (specify)	0%

Status of Hardware/Software Development: We are in an R&D prototype fabrication phase with a Russian Aerospace firm to produce and pressure test (5) 1/5 scale composite upstream vacuum vessel and entering/exiting beam pipes to verify material technology and analytical models. IHEP collaborators are working on vessel engineering analysis and monitoring the Russian vendor. We are in contact with interested US vendor who has submitted a draft design/fabrication proposal for a composite upstream vacuum vessel. A recent hire of a consultant engineer at BNL is analyzing various vessel geometries and materials for the upstream vacuum vessel and entering/exiting beam pipes.

Issues (funding, collaborator shortage, engineering help, etc.): This subsystem needs a Subsystem Manager and Project Engineer to plan and coordinate a critical design effort for the detector decay volume hardware. Funding is needed to hire appropriate resources to begin engineering R&D effort on the many technical challenges. The upstream vacuum vessel (3m Ø x 4m lg. x thin wall) offers the greatest technical design risk due to buckling instability of the geometry. The entering/exiting beam pipes with wide aspect ratio requires reinforced structural ribs of low-Z material and must accommodate interlaced detector elements and pump-out ports. The CPV detector located in the upstream vacuum vessel must be isolated from the high vacuum decay region by a thin vacuum membrane. All of these efforts will require extensive design, analysis, prototyping, and testing to develop a workable solution.

RSVP Review Status Sheet

Due in RSVP Project Office on January 14, 2005

KOPIO Construction Project

WBS No. 1.2.2 **Title: "Preradiator"** **Date 01/03/05**
Preparer/Manager: Toshio Numao **Current Cost Est. (FY05 $M) = 30.9**

Assigned Contingency % = 17%

Cost Elements (FY05$M): Matls. = 15.91; Effort = 10.45; Ohd. = xx.x; Conting. = 4.49; Total = 30.9

WBS Dictionary Definition: The Preradiator consists of 32 modules, each containing eight layers of dual coordinate drift chambers and nine layers of scintillator, with all necessary electronics for read out and data transmission. The effort is distributed between Chamber System (1.2.2.1), scintillator system (1.2.2.2), electronics (1.2.2.3), mechanics (1.2.2.4) and the photon veto system (1.2.2.5), and the effort necessary to design, prototype, fabricate, install, and commission the Preradiator system. This WBS is a summary level. Detail description and cost estimation are completed at lower levels

Technical Level of Confidence: (choose one)	*Prototype* Demonstrated	_X_	*Elements* Built & Tested	__
	Similar *system* exists	__	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	34.3%	Engineered design	0%
(by percentage of total cost;	Engineered conceptual	24.3%	Scientist conceptual	41.4%
sum of fractions a-f = 100%)	Guess	0%	Other (specify)	0%

Status of Hardware/Software Development: The basic performances of the present design such as resolutions have extensively been tested with prototypes and proven to be adequate. Construction technique has been developed with several prototypes. A full scale module will be built by the middle of this year, and in 2006 we will start construction of the preradiator modules; the first module (also considered to be the second prototype) may take a half year for establishing the procedures and training the workers.

Issues (funding, collaborator shortage, engineering help, etc.): We have not identified the institute that builds external photon veto system although the design is identical to that of the calorimeter system and the cost has been included in the estimates. The installation scheme of the preradiator system has not been finalized yet.

DRAFT - RSVP Review Status Sheet - DRAFT

Due in RSVP Project Office on January 14, 2005

WBS No. 1.2.3 Title: "Calorimeter System" **Date 01/03/05**

Preparer/Manager: "Vladimir Issakov" **Current Cost Est. (FY05 $M) = 9.73**
Assigned Contingency %= 23.7%

Cost Elements (FY05$M): Matls. = 4.48; Effort = 3.39; Ohd. = xx.x; Conting. = 1.86; Total = 9.73

WBS Dictionary Definition: Purpose of Photon Calorimeter is an energy and timing measurement of the decay photons with precision of ~3.5%/√E(GeV) and ~100(psec)/√E(GeV), respectively, and vetoing of background with efficiency better than 10^{-4}. Calorimeter System includes: Mockup of Calorimeter System - the complete-equipped prototype of Calorimeter system (16×8 modules), to study the performance parameters of the Preradiator/Calorimeter systems and to develop DAQ, Front-End-Electronic, the pattern recognition algorithms; Photon Calorimeter itself (2740 APD-instrumented modules, Calorimeter Mechanics & Cooling-system); Calorimeter HV-system; Calorimeter "cosmic-ray" Calibration-system, Calorimeter Monitoring-system and Calorimeter Readout-system.

Technical Level of Confidence:	*Prototype* Demonstrated	√	*Elements* Built & Tested	__
(choose one)	Similar *system* exists	__	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	10%	Engineered design	60%
(by percentage of total cost;	Engineered conceptual	20%	Scientist conceptual	10%
sum of fractions a-f = 100%)	Guess	0%	Other (specify)	0%

Status of Hardware/Software Development:

Prototype for a KOPIO Shashlyk calorimeter with energy resolution of 3%/√E(GeV), time resolution of 90(psec)/√E(GeV) and the photon detection inefficiency less than 5×10^{-5} has been constructed and experimentally tested. ***The tested parameters of Calorimeter prototype well meet the design goals of the experiment.*** Prototype of the readout chain has been modeled, tested and fits well in the overall KOPIO readout scheme. The high-voltage, monitoring and calibration systems have been also designed, based on existing technology. Preliminary prototypes of these systems have been tested and their parameters will well meet the required precision and stability necessary to maintain the energy resolution of Calorimeter. The mechanical issues in mounting a large calorimeter have been addressed and solved in existing detectors. To optimize the Calorimeter module design, the Monte-Carlo simulation model of the Shashlyk module response to incident particles was developed. It includes the effects of shower evolution, light collection in scintillator tiles and light transmission in WLS fibers, response of the photo-detector and noise of all electronic chain. This model describes very well the experimental data.

The engineering design of Shashlyk calorimeter module is done and a pre-production line for fabrication of a pilot batch of the KOPIO Photon Calorimeter modules is ready to start fabrication of Mockup of Calorimeter System.

All of that give us confidence in our cost and manpower requirement estimates.

Issues (funding, collaborator shortage, engineering help, etc.):

To finalize a conceptual mechanical design of whole Calorimeter System we need final solution about design of Vacuum System.

RSVP Review Status Sheet

Due in RSVP Project Office on January 14, 2005

KOPIO Detector Construction Project

WBS No. 1.2.4 Title: "Charged Particle Veto" **Date 01/11/05**

Preparer/Manager: "Andries van der Schaaf" **Current Cost Est. (FY05 $M) = 5.70**
Assigned Contingency % = 37.6%

Cost Elements (FY05$M): Matls. = 2.53; Effort = 1.61; Ohd. = ee.f; Conting. = 1.56; Total = 5.7

WBS Dictionary Definition:
The Charged Particle Veto System (CPV) has the purpose to recognize K decays with two or more charged particles in the final state which otherwise mimic a signal event. The system contains three components (a fourth component is integrated into the photon veto system inside sweeping magnet D4) situated inside the decay tank and downstream beam pipe:

1) **The Barrel CPV consists of plastic scintillator modules surrounding the decay region with the exception of the areas where the beam crosses.**
2) **The Beam Chamber is a 5-plane low-pressure MWPC covering the downstream hole in the Barrel CPV.**
3) **The Downstream CPV consists of plastic scintillator modules lining the beam pipe in the region between Beam Chamber and D4.**

In the case of 2) and 3) it is the combined detection efficiency that has to meet the requirements.

Technical Level of Confidence: *Prototype* Demonstrated

Basis of the Cost Estimate:	Commercial product	75%	Engineered design	0%
(by percentage of total cost;	Engineered conceptual	15%	Scientist conceptual	10%
sum of fractions a-f = 100%)				

Status of Hardware/Software Development:
1) Prototype built and tested
2) Test chamber built and partially tested
3) Concept defined, to be confirmed by R&D

Issues (funding, collaborator shortage, engineering help, etc.):
- Design linked with decay tank
- ~50% shortage of manpower (mainly physicists)
- Practically no exterior funding for hardware

RSVP Review Status Sheet
Due in RSVP Project Office on January 14, 2005

WBS No. 1.2.5 Title: "Photon Veto" **Date 01/14/05**

Preparer/Manager: "Oleg Mineev" **Current Cost Est. (FY05 $M) = 11.71**
Assigned Contingency % = 35%

Cost Elements (FY05$M): Matls. = 5.43; Effort = 3.25; Ohd. = ee.f; Conting. = 3.02; Total = 11.71

WBS Dictionary Definition: The Photon Veto system is comprised of lead-scintillator detectors read-out with wave-shifting fibers and photomultiplier tubes. It is designed to detect and veto photons from decays other than the searched mode. These detectors are located near the vacuum decay volume. There are 4 major subsystems described under this heading. They are: 1- the Upstream Photon Veto (1.2.5.1). The detector forms a wall upstream of the decay volume; 2- the Barrel Photon Veto (1.2.5.2). The detector forms a cylinder that surrounds the decay volume. It is located downstream of the Upstream Photon Veto, but upstream of the preradiator system; 3- the Magnet Photon Veto (1.2.5.3). The detector lines the sweeping magnet which is just downstream of the calorimeter system; 4- the Downstream Photon Veto (1.2.5.4). The detector lines the vacuum region downstream of the sweeping magnet.

Technical Level of Confidence:	*Prototype* Demonstrated	**yes**	*Elements* Built & Tested	__
(choose one)	Similar *system* exists	__	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__

Basis of the Cost Estimate:	Commercial product	22 %	Engineered design	8 %
(by percentage of total cost;	Engineered conceptual	35 %	Scientist conceptual	20 %
sum of fractions a-f = 100%)	Guess	15 %	Other (specify)	0 %

Status of Hardware/Software Development: Conceptual design of all detectors has been worked out. R&D and GEANT simulation show performance of detectors sufficient to meet their specified tasks. A few prototype modules were manufactured and tested. Developed technology demonstrated no large problems to create the detectors. Current status is preparation for mass-production. The total detector size is fixed. GEANT simulation is under way to optimize the required performance before mass-production begins. Mechanical design for the detector support begins. Readout instrumentation and front-end electronics for photon veto detectors are unified with the calorimeter ones except photodetectors. Instrumentation and front-end electronics are in engineering design. GEANT models for detectors have been done and used to investigate the physics events reconstruction. Study of algorithms to reconstruct the digitized pulse shape begins.

Issues : Magnet Photon Veto is installed inside the D4 magnet which already exists. Engineering help is required to incorporate the detector in the magnet. Some R&D is planned for Magnet Photon Veto to make a final design of the light readout with spliced WLS and clear fibers. Upstream Photon Veto and Downstream Photon Veto final designs depend on the vacuum pipe development. Besides DS Veto is located inside the vacuum pipe so the optical readout through the pipe walls must be engineered. Mechanical support design for Barrel Veto poses a conflict between the requirement to keep all gaps between the modules as low as possible and achievable in large splitted setup tolerances. BV mechanics is designed taking into account the assembling issues as well as the shashlyk module mechanical parameters. Front-end electronics (waveform digitizers) is a new development which will require a new approach to analyze the signals.

DRAFT - RSVP Review Status Sheet - DRAFT

Due in RSVP Project Office on January 14, 2005

[Please fill in all items in red type]

WBS No. 1.2.6 Title: "Catcher system" **Date 01/14/05**

Preparer/Manager: "Tadashi Nomura / Noboru Sasao" **Current Cost Est. (FY05 $M) = 3.38**
Assigned Contingency % = 11.0%

Cost Elements (FY05$M): Matls. = 2.96; Effort = 0.09; Ohd. = 0.00; Conting. = 0.33; Total = 3.38

WBS Dictionary Definition:

"Photon detectors to catch photons coming along the neutral beam line.
The aerogel catcher is placed in the beam and the guard counter covers the halo region."

Technical Level of Confidence:	*Prototype* Demonstrated	X	*Elements* Built & Tested	__
(choose one)	Similar *system* exists	__	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	71.2%	Engineered design	0%
(by percentage of total cost;	Engineered conceptual	12.4%	Scientist conceptual	10.1%
sum of fractions a-f = 100%)	Guess	6.3%	Other (specify)	0%

Status of Hardware/Software Development:

The proof of principle has been done by two generations of prototypes.
(Our simulation well reproduces the results.)
Quality checking systems for elements (aerogel, PMT…) have been developed.
Full size prototype module is now being designed.

Issues (funding, collaborator shortage, engineering help, etc.):

No technical difficulty
Support by Japan-US cooperative program expected

WBS No. 1.2.7 Title: "Trigger" **Date 01/10/05**

Preparer/Manager: "Nello Nappi"

Current Cost Est. (FY05 $M) = 5.93
Assigned Contingency % = 40.8%

Cost Elements (FY05$M): Matls. = 2.07; Effort = 2.14; Ohd. = ee.f; Conting. = 1.72; Total = 5.93

WBS Dictionary Definition: Development of the algorithms and of the electronics for the on line selection of events. The system includes dedicated digitizers of preradiator, calorimeter and veto scintillator signals, a pipelined logic system requiring design and construction of three types of collector boards, three types of logic modules, a trigger supervisor system and the RF synchronized clock system.

Technical Level of Confidence:	*Prototype* Demonstrated	__	*Elements* Built & Tested	__
(choose one)	Similar *system* exists	__	Similar *technology* works	_X_
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	8%	Engineered design	--%
(by percentage of total cost;	Engineered conceptual	14%	Scientist conceptual	78%
sum of fractions a-f = 100%)	Guess	--%	Other (specify)	--%

Status of Hardware/Software Development: pre-conceptual

Issues (funding, collaborator shortage, engineering help, etc.): None of the groups within the collaboration can provide yet significant levels of involvement in the trigger design and development. In particular at present no engineering support is available. The project will require at least 5FTE physicists and 5 FTE engineers from now to the time of completion. In order to make it viable, new collaborators have to be found or new manpower resources have to become available for some of the existing groups.

DRAFT - RSVP Review Status Sheet - DRAFT
Due in RSVP Project Office on January 14, 2005

WBS No. 1.2.8 Title: "DAQ" **Date 01/03/05**

Preparer/Manager: "George Redlinger"

Current Cost Est. (FY05 $M) = 5.72
Assigned Contingency % = 25.4%

Cost Elements (FY05$M): Matls. = 2.53; Effort = 2.03; Ohd. = ee.f; Conting. = 1.16; Total = 5.72

WBS Dictionary Definition:
DAQ refers to the transfer of digitized data from the front-end electronics after a Level 1 trigger accept. DAQ consists of three main components: Event Builder, Level 3 Trigger and Online Software. The Event Builder receives digitized data from the front-end electronics and combines the event fragments into complete events. The Event Builder is based on a farm of computers communicating with the front-end electronics through a network switch. The Level 3 trigger receives complete events from the Event Builder, applies additional event filtering criteria and sends the surviving events to permanent storage; it can also perform detector calibrations and monitoring in real-time with access to a much larger data set than would be available from permanent storage. The Level 3 trigger is based on a farm of computers communicating with the Event Builder computers through Gigabit ethernet. Online Software is the glue that holds the DAQ system together. It includes a run controller, a user interface, an event logger, interfaces to the Event Builder, to the L1/L3 trigger systems, to the slow control and to online monitoring/calibration tasks.

Technical Level of Confidence: (choose one)	*Prototype* Demonstrated	__	*Elements* Built & Tested	__
	Similar *system* exists	__	Similar *technology* works	X
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	44%	Engineered design	0%
(by percentage of total cost;	Engineered conceptual	0%	Scientist conceptual	56%
sum of fractions a-f = 100%)	Guess	0%	Other (specify)	0%

Status of Hardware/Software Development:
The hardware for the Event Builder and part of the Level 3 Trigger is based on commercial computing and networking hardware. There is a possibility for a custom hardware component to the Level 3 Trigger; only a scientist's concept exists for this. The software to control the Event Builder, Level 3 Trigger and the overall data flow will be based heavily on the CMS XDAQ project. Apart from examining the suitability of XDAQ software for KOPIO, no work has been done on customizing it for the experiment. Software for the Level 3 trigger algorithms will need to be written; only a vague idea of the effective algorithms exists at the moment.

Issues (funding, collaborator shortage, engineering help, etc.):

Event Builder:
1. More detailed estimate of data rates from simulation
2. Measurement of real-time performance of small-scale prototype

Level 3 trigger:
1. Development of trigger algorithms and a coherent picture of DAQ and trigger across all levels
2. Measurements of real-time performance on a small-scale prototype. Requires substantial development in the area of offline analysis.
3. Need for custom hardware for Level 3 depends on the as yet unknown performance of the software trigger. No design, no engineer working on this (yet); some prospects of collaboration with BNL Instrumentation.

Manpower:
We need more manpower. Currently we have only one physicist and one electronics technician. Ultimately we need a core of at least 3 physicists and one software engineer to implement the Event Builder, Level 3 Trigger and Online Software. For the Level 3 Trigger algorithm development, we rely heavily on the existence of manpower to develop the offline analysis tools (costed under Offline Software). For the custom Level 3 hardware, we need in addition one electronics engineer and one physicist.

DRAFT - RSVP Review Status Sheet - DRAFT
Due in RSVP Project Office on January 14, 2005

WBS No. 1.2.9 Title: "Offline Computing" **Date 01/12/05**

Preparer/Manager: "Renee Poutissou"

Current Cost Est. (FY05 $M) = 2.92
Assigned Contingency % = 8.5%

Cost Elements (FY05$M): Matls. = 1.1; Effort = 1.6; Ohd. = ; Conting. = .23; Total = 2.92

WBS Dictionary Definition: Offline computing includes both hardware and software needed to process all aspects of the data collected and to simulate the detector performance.
The hardware consists of a compute farm for data reduction and analysis and of several individual workstations. The major software components are simulations, reconstruction, analysis and tools.

Technical Level of Confidence:	*Prototype* Demonstrated	__	*Elements* Built & Tested	__
(choose one)	Similar *system* exists	_X_	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	50%	Engineered design	b%
(by percentage of total cost;	Engineered conceptual	c%	Scientist conceptual	50%
sum of fractions a-f = 100%)	Guess	e%	Other (specify)	f%

Status of Hardware/Software Development: Most hardware components are not needed for the first couple of years since we are using computing resources at remote locations.
In the software area, work is proceeding almost exclusively in the simulations area at the moment. Now that the simulation review is over, it is expected to have some manpower for the reconstruction topic. Investigating the GLAST software as a potential starting point.

Issues (funding, collaborator shortage, engineering help, etc.): - collaborator representative of each subsystem needed to participate in overall software design and development

DRAFT - RSVP Review Status Sheet - DRAFT

Due in RSVP Project Office on January 14, 2005

[Please fill in all items in red type]

WBS No. 1.2.10 Title: "Detector Systems" **Date 01/03/05**

Preparer/Manager: "Ralph Brown"

Current Cost Est. (FY05 $M) = 11.69
Assigned Contingency % = 31.7%

Cost Elements (FY05$M): Matls. = 3.26; Effort = 5.61; Ohd. = ee.f; Conting. = 2.82; Total = 11.69

WBS Dictionary Definition: The KOPIO Detector, large in size and scope, offers as a project many technical challenges in subsystem design, fabrication, installation, testing and commissioning. The overall detector design, utility requirements, installation, testing and commissioning efforts requires managerial control and oversight to assist individual subsystems in their construction efforts. These efforts also include KOPIO Project interface and interaction with the Collider-Accelerator (C-A) project personnel to insure that beam transport and detector meet the physics operational goals as specified in the baseline. The elements of this subsystem establish the KOPIO project management controls for detector integration, installation, conventional systems, testing and commissioning. It includes the cost and schedule of all materials and labor required to accomplish this effort.

Technical Level of Confidence:	*Prototype* Demonstrated	__	*Elements* Built & Tested	__
(choose one)	Similar *system* exists	_X	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	0%	Engineered design	0%
(by percentage of total cost;	Engineered conceptual	100%	Scientist conceptual	0%
sum of fractions a-f = 100%)	Guess	0%	Other (specify)	0%

Status of Hardware/Software Development: Conceptual installation plan has been developed and work with individual KOPIO subsystems to refine plan is ongoing. Resource loaded schedule for Detector Systems is an engineering estimate based on direct experience with similar large detector construction projects (STAR/RHIC).

Issues (funding, collaborator shortage, engineering help, etc.): Continued effort in support of this subsystem requires funding for engineering and design resources. Recent RIF at BNL and loss of engineering and technical labor force in the region is an issue.

RSVP Review Status Sheet

Due in RSVP Project Office on January 14, 2005

KOPIO Detector Project

WBS No. 1.2.11 Title: Project Services **Date 01/03/05**

Preparer/Manager: Steve Kane **Current Cost Est. (FY05 $M) =8.1**
Assigned Contingency % = 11.0%

Cost Elements (FY05$M): Matls. = .80; Effort = 3.5; Ohd. = 3.0; Conting. = .8; Total = 8.1

WBS Dictionary Definition: This is a Level-of-Effort task for management of the KOPIO Detector Construction Project. It comprises an Administrative function and a Technical function. The Administrative function comprises a full-time Project Manager and secretary, and a half-time budget/schedule person. Material estimates cover travel, reviews, supplies, and space and communications charges at BNL. The Technical function comprises a Chief Engineer, a FEE Coordinator, and AGS Modifications and AGS Beams/Experimental Area.

Technical Level of Confidence:	*Prototype* Demonstrated	__	*Elements* Built & Tested	__
(choose one)	Similar *system* exists	__	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	0%	Engineered design	0%
(by percentage of total cost;	Engineered conceptual	0%	Scientist conceptual	0%
sum of fractions a-f = 100%)	Guess	0%	Other (specify)	100%

Status of Hardware/Software Development: This is a Level-of-Effort task for management of the KOPIO Detector Construction Project.

Issues (funding, collaborator shortage, engineering help, etc.) All technical positions are onboard and involved. Space and other charges at BNL are uncertain, because this is not a DOE project. Space required at BNL not yet identified. Risk is standing-army costs if project schedule slides. A one-year slip should have a contingency of 20%.

RSVP Review Status Sheet

WBS No. 1.3.1 Title: Extinction **Date 01/18/05**

Preparer/Manager: William Molzon **Current Cost Est. (FY05 $M) = 2.3**
Assigned Contingency % = 43%

Cost Elements (FY05$M): Matls. = 1.03; Effort = 0.36; Ohd. = 0.20; Conting. = 0.69; Total = 2.28

WBS Dictionary Definition: This item comprises 4 major sub-items; a way of measuring the time structure in the circulating AGS beam, a magnet system in the primary proton beam that provides a time modulated magnetic kick phased with the proton micropulses, a system of magnets, collimators and detectors that can be used to measure the time structure of particles in the extracted beam (upstream of the secondary extinction device) with a dynamic range of 10^9 within a few minutes, and a system of magnets, collimators and detectors that can be used to measure the time distribution of particles hitting the muon production target with a dynamic range of 10^9 in a few minutes.

Technical Level of Confidence:	*Prototype* Demonstrated	__	*Elements* Built & Tested	__
(choose one)	Similar *system* exists	_x_	Similar *technology* works	_x_
	Novel system concept	__	No candidate concept yet	__
	Other: Different parts can be described by each of the above			

Basis of the Cost Estimate:	Commercial product	20%	Engineered design	5%
(by percentage of total cost;	Engineered conceptual	5%	Scientist conceptual	35%
sum of fractions a-f = 100%)	Guess	35%	Other (specify)	f%

Status of Hardware/Software Development: Some items (e.g. small dipole magnets with power supplies) exist and they need refurbishing; this cost is identical to that for other magnets as estimated by AGS personnel. Most hardware designs (e.g. the RF modulated magnets and their power supplies and network) exist only in a conceptual sense; similar stripline magnets are used at the AGS, but no hardware development specific to our magnets has been done. It is likely that the RF power amplifiers will be commercial products, either off-the-shelf or modifications made by commercial vendors. These devices are used for a number of applications such as AM radio and plasma power devices. A very small prototype of the LRC network has been made and a commercial vendor for the capacitors has been found. The detectors for the extinction measurements external to the AGS are similar to detectors built for many similar applications and no prototype or hardware development specific to our devices has been done. The software necessary to do the design work exists (TOSCA and ELECTRA models, GEANT models) for the devices we will build.

Issues (funding, collaborator shortage, engineering help, etc.): We need physicist power to do the studies and we have a graduate student experienced in TOSCA and ELECTRA doing this now; he is also doing the GEANT studies. We need a postdoc to work on this for which we don't currently have funds, and also mechanical and electrical engineering help. We are searching for a mechanical engineer (for which we have funds for one year salary) and will need a fraction of an electrical engineer's effort on this, for which we do not have money. Testing the performance of both the extinction in the AGS and the performance of this device in a beam are both critical, and the currently foreseen schedule is very late.

RSVP Review Status Sheet

WBS No. 1.3.2 Title: "Production Target and Shield" **Date 01/17/05**

Preparer/Manager: "Hebert" **Current Cost Est. (FY05 $M) = 2.76**
Assigned Contingency % = 40.9%

Cost Elements (FY05$M): Matls. = 1.78; Effort = 0.12; Ohd. = 0.06; Conting. = 0.80; Total = 2.76

WBS Dictionary Definition: "This task includes a conceptual design for the experiment's water-cooled pion production target, prototype testing of that design, and the design and fabrication of the heat and radiation shield within the Production Solenoid. Note that although the costs for MECO participation in beam testing of the production target are included here, the larger costs of running the beam and preparing an area for the test are contained in WBS 1.4.4. The water-cooled heat shield serves to limit the nuclear heating and radiation damage to the coils of the Production Solenoid as well as supporting the target assembly."

Technical Level of Confidence: (choose one)	*Prototype* Demonstrated	__	*Elements* Built & Tested	__
	Similar *system* exists	__	Similar *technology* works	X
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	0%	Engineered design	20%
(by percentage of total cost;	Engineered conceptual	0%	Scientist conceptual	60%
sum of fractions a-f = 100%)	Guess	20%	Other (specify)	0%

Status of Hardware/Software Development: "We have an incomplete design study of the heat shield. That study did not reach the point of producing a cost estimate prior to the lead engineer leaving the lab. We have detailed thermodynamic and hydrodynamic models of the production target, backed up with prototypes tested using induction heating."

Issues (funding, collaborator shortage, engineering help, etc.): "We have identified a potential new collaborator that has an interest in taking on the heat shield portion of this system. The production target design effort at UCI would benefit from a post-doc dedicating a significant fraction of his or her time to studying details and conducting prototype induction heating tests."

RSVP Review Status Sheet

WBS No. 1.3.3 Title: Solenoids **Date 01/13/05**

Preparer/Manager: Brad Smith **Current Cost Est. (FY05 $M) = 55.2**
Assigned Contingency % = 28.6%

Cost Elements (FY05$M): Matls. = 18.6; Effort = 12.4; Ohd. = 12.4; Conting. =12.3; Total = 55.2

WBS Dictionary Definition:
This comprises the complete set of superconducting magnets including the magnets themselves (coils, mandrels, thermal shields, vacuum vessels, internal sensors, interface connections, etc.), the power supplies, the control system, the liquid helium refrigerator/liquefier, and any control box for cooling distribution.

Technical Level of Confidence:				
	Prototype Demonstrated	__	*Elements* Built & Tested	__
	Similar *system* exists	__	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

The MECO magnet system design is currently based on a mature conceptual design which has been presented in detail in the Conceptual Design Report (CDR) and subsequent updating memoranda, and which has been successfully reviewed now several times by both national and international magnet review teams. The design itself represents an assembly and integration of a large number of smaller components, most of which can be considered as technologically similar to items which have been previously successfully fabricated. A large challenge of this project is with the overall size of the system. A successful magnet system requires attention to detail in the final design process, an approved, quality-assured, and in-control manufacturing process, and an installation approach which has been carefully planned and agreed to by the MECO project, the fabrication Vendor(s), and BNL. Preliminary tolerance studies conducted at MIT/UCI have shown that specification of warm magnet dimensions with reasonable manufacturing tolerances should be sufficient to provide magnets that will meet the field specification when the magnets are cooled to 4.5 K and energized.

Basis of the Cost Estimate:	Commercial product	5%	Engineered design	0%
(by percentage of total cost;	Engineered conceptual	95%	Scientist conceptual	0%
sum of fractions a-f = 100%)	Guess	0%	Other (specify)	0%

The magnet cost estimate is based on a MIT bottoms-up estimate of the individual cost items. Labor is generally estimated based on a detailed hourly breakdown of each task using appropriate labor categories with industry-standard labor rates. A selected sub-set of the cost elements (conductor, coil mandrels, magnet iron, power supplies, quench protection equipment, refrigerator/liquefier) were obtained via budgetary estimates from industry. Also, General Atomic (San Diego, CA), in an industrial subcontract to UCI, provided generally corroborating costs for each of the PS, TS and DS magnet cryostats and their contents, which comprise 56% of the estimated WBS 1.3.3 cost total. Magnet costs have been reviewed once at the end of the CDR in Feb02 and again at the RSVP magnet review in Oct04.

This cost estimate includes the full estimated cost for magnet final design as presented in the Oct04 magnet review. This amount is within a few percent of the amount included in a detailed final design plan for the magnet presented in a meeting at BNL on December 13, 2004. A supplemental funding request has been submitted by RSVP to provide early funding for RSVP project management and for high priority magnet design activities identified in the Oct04 review. The amount of the supplemental funding request that would accrue to the magnets, if approved in full, would be $690 k. Any amount awarded to the magnets from the supplemental request would decrease the $55.2 M identified here on a dollar by dollar basis.

Status of Hardware/Software Development:
Much of the magnet hardware relies on superconducting magnet technology that has been available in the community at large for some time. A limited number of low-cost R&D tasks have been proposed as part of the present plan for magnet final design that will lead more confidently to a fabrication specification for the magnets. The magnet R&D tasks are generally intended to retire risk on certain aspects of the design through laboratory testing of manufactured samples and prototypes. Specifically, these R&D items include the following:

Conductor testing

Three types of conductor tests are planned. In all cases, any degradation noted in the test sample measurements will be accommodated in the final design.

- SSC inner cable test
  SSC inner and outer cables are key-stoned and have been in storage on spools since the 1990's. MECO uses both inner and outer cable types which will generally be soldered into copper channels to provide adequate cross-section for parallel current flow during magnet quench. The production solenoid (PS) conductor operates in the highest field and therefore uses SSC inner cable. It operates with the lowest temperature margin of 1.5 K. Therefore, a short length of SSC-inner cable will be sent to BNL for critical current testing ($J_c(B)$) and data will be compared with historical SSC inner cable data.

- De-keystoned SSC outer cable test
  The TS coil modules close to the anti-proton-stopping window have large radial builds to maintain magnetic field in the warm gap. To avoid excessive radial builds, these modules use bare, de-keystoned, SSC outer cable. The cable has sufficient copper cross-section for quench protection without the need for the copper channel. De-keystoning this cable will enable the maintenance of a high winding pack fraction and smooth coil layer geometry. Therefore, a short length of SSC-outer cable will be sent to New England Wire for de-keystoning, and then to BNL for critical current testing. Test data will be compared with historical SSC outer cable test data.

- SSC inner cable-in-channel test
  A trial length of PS cable-in-channel conductor will be fabricated at Outokumpu. A short length of this sample will be sent to BNL for critical current testing. Test data will be compared with bare cable test results.

Conductor stack tests

Rectangular, prism-shaped, stacks of insulated conductors will be tested to determine the compressive and tensile moduli of the composite winding. Data will be taken at room temperature and at 77 K. This measurement data will be used to re-evaluate magnet quench stresses which are driven by thermal strain.

Copper winding

A TS-sized copper winding is planned to validate electrical insulation materials and impregnation processes. The coil design will enable cryogenic winding temperature measurements intended to validate the conduction-cooled design in a later step in the plan. Conduction cooling the PS was a recommendation of the MOG in the Oct04 magnet review. Copper coil fabrication is funded by the supplemental request, but follow-on testing requires additional funding. The test plan calls for cooling the copper coil to near liquid helium temperature and then to energize it at low current to create a heat flux at the cooled surface that is equal to the heat flux from the nuclear heat load in the PS. Coil temperature distribution will be measured. The coil will then be pulsed to high current to simulate high Lorentz loading. The coil with then be re-cooled to near liquid helium temperature and the temperature distribution measurements at low current repeated. Finally, the copper test coil will be sectioned and examined.

Joint trials

Clamping, heating and soldering techniques will be established to form the basis of conductor joint fabrication processes.

Issues (funding, collaborator shortage, engineering help, etc.):

Funding

Some R&D tasks (3 out of 4 conductor stack tests, copper winding, and joint trials) and many final design tasks require funding from the RSVP Supplemental request and from the FY05 RSVP MREFC funding authorization. MIT has prepared a magnet final design plan which will lead to one or more RFP's for the magnet system. The schedule for this plan is highly dependent upon the timely arrival of funds from both the Supplemental request and from the FY05 RSVP MREFC funding authorization.

Engineering personnel

The MIT final design plan was presented in an exploratory meeting with RSVP management, the MOG chairman, and leaders from BNL-SMD on December 13, 2004. In this meeting, MIT proposed a task sharing arrangement whereby BNL personnel might contribute to the final design of the magnet peripheral equipment. No action was taken at this meeting, but an early clarification of any possible BNL role would facilitate planning.

Design for safety

A key deliverable during the magnet final design period is the documentation package that will support a magnet RFP. This package will include a statement of work for magnet fabrication and a fabrication specification that captures key requirements for not only magnet performance but also safety. A clear methodology for melding BNL safety committee requirements into the final design activity and incorporating those requirements in the magnet documentation package is needed. MIT presented some preliminary recommendations regarding safety integration into the magnet design at the December 13 meeting, but no action has been taken.

RSVP Review Status Sheet
Due in RSVP Project Office on January 14, 2004

WBS No. 1.3.4 Title: Muon Beamline **Date 01/14/05**

Preparer/Manager: William M. Morse **Current Cost Est. (FY05 $M) = 3.59**
Assigned Contingency % = 26%

Cost Elements (FY05$M): Matls. = 1.24; Effort = 0.99; Ohd. = 0.59; Conting. = 0.73; Total = 3.59

WBS Dictionary Definition:

1.3.4 Muon Beamline

The muon beamline consists of the elements within the Transport Solenoid that define the beam and those within the Detector Solenoid that are not used to detect conversion electrons. In the Transport Solenoid these include three collimators that define the accepted muon momentum spectrum, the anti-proton stopping window, and the vacuum system. The muon beam stop is a reentrant dump at the exit of the detector solenoid in which muons that neither stopped in the target nor decayed come to rest. The neutron absorbers consist of lithium or boron doped polyethylene in a cylindrical shell around the region of the stopping target at large radius. The purpose is to absorb neutrons emitted following muon capture. A system of rails both on the floor of the experimental area and on the lower portion of the Cosmic Ray Shield allow the End Cap Support to translate. It will also provide support for intermediate carts required by the tracker and calorimeter. A Germanium crystal x ray detector measures the absolute rate for muonic atom formation, and functions as a continuous real-time muon beam monitor.

1.3.4.1 Vacuum System

Vacuum System is the warm bore region of the Solenoid Magnets as described in "Muon Beamline Vacuum System Reference Design". The vacuum level is 10^-4 Torr. The vacuum is divided into the DS Vacuum and the PS Vacuum. The PS/TSu and TSd/DS vacuum seals are the responsibility of the Solenoid vendor. The PS Vacuum End Plate, Anti-Proton Stopping Window, Vacuum Pump Spool Piece and Instrumentation Feed-thru Bulkhead vacuum seals are the responsibility of their respective WBS's.

1.3.4.1.1 Detector Solenoid Vacuum System

The DS Vacuum is bounded by the warm bores of the TSd and DS, the Anti-Proton Stopping Window, the Vacuum Pump Spool Piece (WBS 1.3.4.8.6) and the Instrumentation Feed-thru Bulkhead.

1.3.4.1.2 Production Solenoid Vacuum System

The PS Vacuum is bounded by the warm bores of the PS and TSu, the Anti-Proton Stopping Window (WBS 1.3.5.7), the PS Vacuum End Plate (WBS 1.4.4.2.5.3) and the Proton Beamline Vacuum Window (WBS 1.4.4.2.5.1).

1.3.4.1.3 pBar Window Protection System

The pBar Window Protection System is necessary to prevent the window from being overstressed by a large vacuum differential between the PS & DS (the limit is ~8psi). This system will control the rate of pump down/ bleed up as well as operate an emergency bypass valve.

1.3.4.2 TS Collimators and Shielding

The collimators select the appropriate charge and momentum of particles transported to the DS. The shielding shields the TS coils and DS detectors from harmful radiation.

1.3.4.2.1 Collimators Col 1-5

Three brass or copper collimators situated in the TS. The central collimator is split into upstream and downstream halves, one each in TSu and TSd, adjacent to the Anti-proton Stopping Window package. This also includes the twelve copper foils inside the last collimator (see MECO Memo #100).

1.3.4.2.2 Shielding S1-6

Copper shielding inside the TSu warm bore to protect the coils from the beam.

1.3.4.3 Muon Stopping Target

The muon stopping target is a system of 17 thin Al or Ti foils supported with a low mass suspension in the detector solenoid.

1.3.4.4 Detector Shields

The detector shields are thin, low z cylinders and cones in the region between the stopping target and tracking detector that serve the purpose of absorbing low energy protons emitted from the stopping target following muon capture.

1.3.4.5 Muon Beam Stop

The muon beam stop is a reentrant dump at the exit of the detector solenoid in which muons that neither stopped in the target nor decayed come to rest. It contains a low Z absorber at large radii (near the wall of an extension to the detector solenoid and an albedo shield of high Z material to absorb albedo. Provisions are made for it to be quickly removed to provide access to the interior of the detector solenoid.

1.3.4.6 Anti-Proton Stopping Window

The Anti-Proton Stopping Window is defined in "Anti-Proton Stopping Window Design Report". This window stops anti-protons produced in the Production Target from reaching the DS. It also serves to separate the vacuum volume of the DS from the PS to prevent

1.3.4.7 Neutron Absorbers

The neutron absorbers consist of boron doped polyethylene in a cylindrical shell around the region of the production target at large radius. The purpose is to absorb neutrons emitted following muon capture. Boron is used because it has a large cross section for neutron capture without subsequent photon emission.

1.3.4.7.1 Internal Absorbers

These are the absorbers that lie within the DS vacuum volume.

1.3.4.7.2 External Absorbers

These absorbers are external to the DS.

1.3.4.8 Detector Support Structure

This is the system of support rails and carriages required to mount all of the detectors located within the Detector Solenoid. This includes the Stopping Target, the Detector Shields, the Tracker, the Calorimeter, and the Muon Beam Stop.

1.3.4.8.1 Internal Rail System

The system of rails installed within the Detector Solenoid upon which the detector support carts roll.

1.3.4.8.2 End Cap Support and Carriage

The structure that supports the weight of the muon beam stop/vacuum end cap and allows it to translate to afford access to the interior of the Detector Solenoid.

1.3.4.8.3 External Rail System

A system of rails both on the floor of the experimental area and on the lower portion of the Cosmic Ray Shield that allow the End Cap Support to translate. It will also provide support for intermediate carts required by the tracker and calorimeter as they are removed from the Detector Solenoid.

1.3.4.8.4 Intermediate Carriages

These provide support for the Tracker and Calorimeter when they are removed from the Detector Solenoid.

1.3.4.8.5 Muon Stopping Target Support

This is the support for the Muon Stopping Target and the Detector Shields.

1.3.4.8.6 Vacuum Pump Spool Piece (VPSP)

This is the vacuum closure at the downstream end of the DS and it provides a method of passing signal, power and service lines through the vacuum wall.

1.3.4.8.7 Instrumentation Feed-thru Bulkhead

This is the vacuum closure at the downstream end of the DS and it provides a method of passing signal, power and service lines through the vacuum wall.

1.3.4.8.8 Vacuum Feed-thru's

Purchase & installation of vacuum feed-thru's for signals, high voltage, pre-amp power, gating & calibration and gas & cooling lines.

1.3.4.9 Stopping Target Monitor

A high resolution germanium detector will view the muon stopping foils from 15m downstream to collect spectra of characteristic muonic Al-atom x-rays. Observable muonic-Al transitions at 1.2 keV resolution would primarily be the 2p-1s (356 keV), the 3p...

1.3.4.9.1 Germanium Detector

A commercial 40% relative efficiency, N-type intrinsic Ge detector will be purchased. This type is less sensitive to neutron damage caused by muon capture neutrons. Annealing of the crystal could still be needed after 3 months of running.

1.3.4.9.2 Electronics

Front end electronics will consist of a low noise preamp and a high rate, PC-controlled spectroscopy amplifier. The preamp will be a resistive, fast-reset preamplifier capable of handling 800,000 MeV events per sec. An analysis software and hardware-co...

1.3.4.9.3 DS Window and Transport Pipe

X rays pass through a strong, but highly transparent Ti port at the tail end of the DS and enter a free-standing 2 m long, 5cm dia helium-filled pipe. This pipe passes through the SS wall, the CR detector, and the back concrete shield wall where the x ray detector is situated.

1.3.4.9.4 Magnetic Deflector

The initial flash of beam electrons has energies ranging up to 70 MeV and a flux 20 times greater than that of negative muons. Should a high number of these traverse the transport pipe a magnetic deflector can be added.

Technical Level of Confidence: (choose one)	*Prototype* Demonstrated	__	*Elements* Built & Tested	__
	Similar *system* exists	_x_	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	15%	Engineered design	10%
(by percentage of total cost;	Engineered conceptual	40%	Scientist conceptual	25%
sum of fractions a-f = 100%)	Guess	10%	Other (specify)	

Status of Hardware/Software Development: Presently we're doing the physics/ engineering specifications and engineering conceptual designs.

Issues (funding, collaborator shortage, engineering help, etc.). The main issue is that the teamleader (WMM) is doing the physics calculations; see MECO tech notes: 117 and 139 "MECO Detector Solenoid Vacuum Requirements", 98 "DIO Backgrounds with a Ti Target", 88 "Design Considerations for the Anti-proton Stopping Window", 82 "Probability of Proton Ejection from Muon Capture on Aluminum", plus Muon Beamline Semester Reports: 118, 109, 102, 89, 79. Presently I am doing simulations to specify the required tolerances for placement of the collimators. I also would like to think about cosmic ray veto, extinction, and the level 0 trigger physics issues. Additional MECO physics effort in the BNL Physics Department, besides Yannis Semertzidis (extinction) and Peter Yamin (neutron calculations) would have an immediate positive impact, but I'm told "there ain't no money". This is an issue.

RSVP Review Status Sheet

Due in RSVP Project Office on January 14, 2004

[Please fill in all items in red type]

WBS No. 1.3.5 Title: Straw Tracker **Date 01/15/05**

Preparer/Manager: Ed V. Hungerford

Current Cost Est. (FY05 $M) = 4.74
Assigned Contingency % = 19%

Cost Elements (FY05$M): Matls. = 2.7; Effort = 2.0; Ohd. = 0; Conting. = 0; Total = 4.7

WBS Dictionary Definition: The WBS describes the design, purchase and construction of the electron tracking detector.

Technical Level of Confidence: (choose one)

Prototype Demonstrated	__	*Elements* Built & Tested	__
Similar *system* exists	__	Similar *technology* works	X__
Novel system concept	__	No candidate concept yet	__
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost; sum of fractions a-f = 100%)

Commercial product	15%	Engineered design	25%
Engineered conceptual	5%	Scientist conceptual	30%
Guess	24%	Other (specify)	0%

Status of Hardware/Software Development:
There are two possible detector designs under consideration. The present summary costs the most expensive design, although the price difference between the two designs is only 3.5%. The designs use existing technologies, and the choice between them will be mainly physics driven.

Mechanical design

A prototype vane of the L-tracker has been constructed, and problems identified. Several types of resistive straw have been developed and R&D will select the one which is more mechanically rigid with the best resistivity. Costs of these are similar. Various prototypes with strip readout have been tested with beams and sources. Mechanical stability of the L-tracker needs design. A prototype T-tracker plane is under construction. Appropriate straws of both 15 and 25 um for this tracker have been produced.

Electronics

A preliminary electronic readout system has been constructed and tested using prototype detectors with both anode and cathode readout. This system contains digitization for both time and waveform, and is operated under local FPGA control. Design specifications for the digitizing ASIC are essentially completed and engineering work scheduled to begin at LBL in March/April.

Issues (funding, collaborator shortage, engineering help, etc.): Engineering design, mainly mechanical, is critically needed. Funding at an appropriate level to complete the detector R&D so that the detector design can be fixed is necessary. Additional personnel to develop, in particular the L-tracker prototype, is desirable

RSVP Review Status Sheet
Due in RSVP Project Office on January 14, 2004

WBS No. 1.3.6 Title: "Electron Calorimeter" **Date 01/14/05**

Preparer/Manager: "Peter Nemethy"

Current Cost Est. (FY05 $M) = 07.92
Assigned Contingency % = 24.4%

Cost Elements (FY05$M): Matls. = 04.2; Effort = 01.4; Ohd. = 00.8; Conting. = 1.6; Total = 7.9f

WBS Dictionary Definition: "Electron Calorimeter. The calorimeter is the primary hardware trigger for the experiment and constrains the measured electron energy and reconstructed impact point (shower centroid) in each event. The calorimeter consists of 4 vanes of 288 Lead-tungstate crystals for a total of 1152 crystals and 2304 channels of detectors and readout electronics"

Technical Level of Confidence: (choose one)	*Prototype* Demonstrated	__	*Elements* Built & Tested	X__
	Similar *system* exists	__	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	5%	Engineered design	%
(by percentage of total cost;	Engineered conceptual	%	Scientist conceptual	85%
sum of fractions a-f = 100%)	Guess	10%	Other (specify)	%

Status of Hardware/Software Development: " Laboratory bench tests of complete calorimeter channels and their readout electronics are under way, at the fewer than 10 crystal level"

Issues (funding, collaborator shortage, engineering help, etc.): "Senior Electrical Engineer (chief electrical engineer for MECO) has not been hired yet at NYU, but will be needed for both the design and building phases. Mechanical Engineering and Designer effort from outside NYU will be needed for the mechanical and cooling design and construction. A 25 crystal Prototype beam test in a laser backscattering experiment will be needed."

RSVP Review Status Sheet

WBS No. 1.3.7 Title: Cosmic Ray Shield **Date 01/17/04**

Preparer/Manager: John Kane **Current Cost Est. (FY05 $M) = 1.67**
Assigned Contingency % = 13%

Cost Elements (FY05$M): Matls. = 1.17; Effort = 0.20; Ohd. = 0.10; Conting. = 0.19; Total = 1.67

WBS Dictionary Definition: This WBS element consists of the active part of the cosmic ray shield, including multiple layers of scintillation counters, with photodetectors, preamps, calibration system. The trigger electronics and DAQ are not part of this subsystem. The passive shield (concrete) is not included in this WBS item. Manpower for installation in the experiment is not included. Simulation of the performance is not included in this WBS. Much of the cost is in academic personnel, the cost of which is not included.

Technical Level of Confidence:	*Prototype* Demonstrated	__	*Elements* Built & Tested	_x_
(choose one)	Similar *system* exists	__	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	60%	Engineered design	0%
(by percentage of total cost;	Engineered conceptual	%	Scientist conceptual	40%
sum of fractions a-f = 100%)	Guess	%	Other (specify)	0%

Status of Hardware/Software Development: Small prototypes have been built and tested. The plastic scintillator is very close in design to that used for the MINOS detector. The readout WLS and optical fibers and the photodetectors are commercial products. The performance can be reliably estimated from the extensive MINOS experience.

Issues (funding, collaborator shortage, engineering help, etc.): Some engineering help is needed in the short term, primarily on support structures. It is anticipated that the William & Mary group will get some additional help from additional collaborators. It is important to get a renewed simulation effort underway, and a postdoc or advancd graduate student is needed for this effort.

RSVP Review Status Sheet

WBS No. 1.3.7 Title: Simulation & Offline Analysis **Date 01/17/04**

Preparer/Manager: Yury Kolomensky **Current Cost Est. (FY05 $M) = 0.97**
Assigned Contingency % = 46%

Cost Elements (FY05$M): Matls. = 0.64; Effort = 0.0; Ohd. = 0.0; Conting. = 0.29; Total = 0.93

WBS Dictionary Definition: This WBS element consists of the simulation and offline analysis for all WBS elements. Major parts are for the tracker, calorimeter, simulations of various parts of the beamline. It includes development of an integrated simulation and analysis framework. Essentially all of the effort is by academic personnel and hence not costed. The effort cost, if included, would add approximately $3.5M.

Technical Level of Confidence:	*Prototype* Demonstrated	__	*Elements* Built & Tested	__
(choose one)	Similar *system* exists	_x_	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	100%	Engineered design	0%
(by percentage of total cost;	Engineered conceptual	%	Scientist conceptual	0%
sum of fractions a-f = 100%)	Guess	%	Other (specify)	0%

Status of Hardware/Software Development: There has been no work on this.

Issues (funding, collaborator shortage, engineering help, etc.): Approximately 2/3 of the personnel needed to do this work are not currently in the collaboration. It will require hiring experienced physics software developers, and the primary difficulty with this is likely to be the long time scale before physics results are expected. The subsystem manager must get a number of people with possibly divergent views on software development to work together, and this has often been difficult.

RSVP Review Status Sheet

WBS No. 1.3.8 Title: "Trigger and DAQ" **Date 01/17/04**

Preparer/Manager: "K. Kumar" **Current Cost Est. (FY05 $M) = 2.47**
Assigned Contingency % = 25.4%

Cost Elements (FY05$M): Matls. = 1.4; Effort = 0.4; Ohd. = 0.3; Conting. = 0.5; Total = 2.5

WBS Dictionary Definition: "This consists of the electronics and computer hardware and software needed to trigger the readout electronics using fast energy sums in the calorimeter, assemble event records, and store selected events for offline analysis. This includes digitizer boards for energy sums, pipelines for buffering event information during trigger processing, event builders for record assembly, a processor farm for post-trigger processing, and a permanent data storage system. Also included is a separate system of electronics and software for slow control and monitoring of all subsystems."

Technical Level of Confidence:	*Prototype* Demonstrated	__	*Elements* Built & Tested	__
(choose one)	Similar *system* exists	__	Similar *technology* works	X
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	15%	Engineered design	0%
(by percentage of total cost;	Engineered conceptual	65%	Scientist conceptual	5%
sum of fractions a-f = 100%)	Guess	15%	Other (specify)	0%

Status of Hardware/Software Development: "Pre-conceptual design of the trigger processor and the colorimeter digitizer module is just beginning. An analysis of the maximum throughput of data through the event builder is under way. Software development for data selection for writing to tape (Level-3 software trigger) will begin in the Fall."

Issues (funding, collaborator shortage, engineering help, etc.): "Substantial software development cannot begin until funding is in place so that new postdoctoral research associates can be hired at UMass and BU. While the BU group will take on the development of the trigger hardware and the UMass group will take on the development of the software trigger, adequate manpower to handle the slow control and monitoring system has not yet been identified."

RSVP Review Status Sheet

WBS No. 1.3.10 Title: "Installation and Integration" **Date 01/17/05**

Preparer/Manager: "Hebert" **Current Cost Est. (FY05 $M) = 3.20**
Assigned Contingency % = 27.6%

Cost Elements (FY05$M): Matls. = 0.11; Effort = 1.57; Ohd. = 0.86; Conting. = 0.66; Total = 3.20

WBS Dictionary Definition: "This task is will contain the installation efforts for all other subsystems in an effort to coordinate them into a single MECO installation plan. This task also includes integration of common systems across the whole of MECO and establishes the requirements for AGS conventional systems (power, chilled water, etc.). Integration includes the mechanical interface control tasks orchestrated by the MECO Chief Mechanical Engineer and similarly the eletrical interface tasks of the MECO Chief Electrical Engineer plus associated Designer effort in preparing envelope drawings, etc.."

Technical Level of Confidence: (choose one)	*Prototype* Demonstrated	__	*Elements* Built & Tested	__
	Similar *system* exists	__	Similar *technology* works	X
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	0%	Engineered design	0%
(by percentage of total cost;	Engineered conceptual	50%	Scientist conceptual	50%
sum of fractions a-f = 100%)	Guess	0%	Other (specify)	0%

Status of Hardware/Software Development: "No designs for any specialized installation hardware. No modeling of installation sequencing. Minimal studies of services routing and subsystem envelopes have been completed."

Issues (funding, collaborator shortage, engineering help, etc.): "There are two major issues with the estimate and another with the system as a whole. In reverse order, the primary issue for this system is that we have not identified a suitable candidate for the MECO Chief Mechanical Engineer that is willing to accept the position. As a result, much needed development of both the I&I plans and their associated costs have languished. Addressing the costs, there are two problems here. The first is that to date, at the PM's request, each subsystem has been assessing its own installation needs and costs. Given the lack of a Chief ME, this seems the best way to make progress in the interim, but as a consequence, nearly none of the installation tasks that belong in this L3 WBS are found here. Instead they remain within each subdetector's WBS area, hence an artificially low number is seen for this effort. The final problem with the numbers quoted here is that they would benefit from another round of detailed comparison with the items in WBS 1.4.4 to be certain that there are no missed tasks or double counting. Time has not permitted such a MECO – BNL scrubbing exercise yet this year."

RSVP Review Status Sheet

WBS No. 1.3.11 Title: "MECO Project Office" **Date 01/17/05**

Preparer/Manager: "Hebert" **Current Cost Est. (FY05 $M) = 4.13**
Assigned Contingency % = 28.7%

Cost Elements (FY05$M): Matls. = 0.47; Effort = 1.69; Ohd. = 1.06; Conting. = 0.92; Total = 4.13

WBS Dictionary Definition: "This task encompasses the personnel and tasks specifically associated with managing the MECO construction effort. Personnel include the MECO Project Manager, Cost and Schedule Manager, and an Administrative Assistant. Additional costs are included for office equipment and defraying the costs of reviewers for MECO."

Technical Level of Confidence: (choose one)	*Prototype* Demonstrated	X	*Elements* Built & Tested	__
	Similar *system* exists	__	Similar *technology* works	__
	Novel system concept	__	No candidate concept yet	__
	Other (Comment)			

Basis of the Cost Estimate:	Commercial product	0%	Engineered design	0%
(by percentage of total cost;	Engineered conceptual	0%	Scientist conceptual	20%
sum of fractions a-f = 100%)	Guess	0%	Other	80%
			Level of effort @ estimated salaries	

Status of Hardware/Software Development: "not applicable"

Issues (funding, collaborator shortage, engineering help, etc.): "New PM needs to be identified. Project office needs to be established at BNL.

BOOSTER AGS MODIFICATIONS
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.1

Title: BOOSTER AGS MODIFICATION

Preparer/Manager: Kevin Brown

Current Cost Est.(FY05 $M) $20.5

Assigned Contingency % 15%

Cost Elements (FY05 $M)

Matls	$7.4
Effort	$6.7
Ohd	$3.3
Conting	$3.1
Total	$20.5

WBS Dictionary Definition: This WBS consists of modifications to the Booster and AGS to prevent RSVP from having an impact on RHIC operations, to allow the Booster and AGS to operate to meet RSVP intensity goals, and modifications that will allow the Booster and AGS to create the beam conditions (bunch structure, frequency, and extinction) as required by RSVP experiments.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	x	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	18.8%	Engineered Design	12.0%
Engineered Conceptual	43.3%	Scientist Conceptual	25.9%
Guess	0.0%	Other (specify)	0.0%
		Total	100%

Status of Hardware/Software Development: All Booster and AGS systems have been evaluated based on the impact of high intensity operations on RHIC operations, maintainability of the Booster and AGS for RSVP, and on the basis of achieving the intensity and throughput goals of RSVP. This WBS represents the result of that evaluation as well as those things specified by RSVP in order to perform the experiments.

Issues (funding, collaborator shortage, engineering help, etc.): The only systems which are defined in the WBS but not costed are the Booster and AGS collimators. This is an issue still being discussed within the C-AD AP group and has not developed far enough to allow an engineer to cost out a system.

BOOSTER AGS MODIFICATIONS
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.1.1

Title: Project Support

Preparer/Manager: Kevin Brown

Current Cost Est.(FY05 $M) $0.3

Assigned Contingency % 16%

Cost Elements (FY05 $M)

Matls	$0.0
Effort	$0.2
Ohd	$0.1
Conting	$0.0
Total	$0.3

WBS Dictionary Definition: This WBS covers the project management of the Booster and AGS modifications. It includes one FTE Liaison engineer management (PE) and 1/2 FTE physicist project management (PPM).

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists		Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)	Project Management		

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	0%	Engineered Design	0%
Engineered Conceptual	0%	Scientist Conceptual	100%
Guess	0%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: This is the costs just for the management. Both the LE and the PPM are also doing engineering and physics under various subsections of the WBS.

Issues (funding, collaborator shortage, engineering help, etc.): This is the projected costs for managing the Booster/ /AGS WBS for the AGS RSVP Project office. These costs are based purely on previous experience and may not properly reflect the demands of the RSVP project. Upper management advice would be useful, given the management complexities of RSVP.

BOOSTER AGS MODIFICATIONS
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.1.2

Title: Booster

Preparer/Manager: Kevin Brown

Current Cost Est.(FY05 $M) $4.9

Assigned Contingency % 19%

Cost Elements (FY05 $M)

Matls	$1.6
Effort	$1.8
Ohd	$0.8
Conting	$0.7
Total	$4.9

WBS Dictionary Definition: Booster Modifications for RSVP: modifications to prevent RSVP from having an impact on RHIC operations, modifications to allow Booster to meet RSVP intensity and beam throughput requirements, and modifications to allow the Booster to remain maintainable throughout RSVP operations.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	x	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	20%	Engineered Design	19%
Engineered Conceptual	46%	Scientist Conceptual	15%
Guess	0%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: This is mostly repairs and improvements to existing designs. Some new designs are involved, such as LINAC to Booster (LTB) transfer line collimators. It includes C3 inflector projection from high intensity protons, collimation in the LTB transfer line, to protect the Booster C5 and C7 main dipole magnets, RF feedback system for the Booster RF to improve beam capture, improvments to instrumentation, other infrastructure improvements to improve maintainability, and shield caps to prevent activated soil from contaminating ground water.

Issues (funding, collaborator shortage, engineering help, etc.): Does not include collimators for the Booster, an issue still being investigated. Also Shield caps are included entirely as a materials cost, since this work is mostly outside contracted.

BOOSTER AGS MODIFICATIONS
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.1.3

Title: AGS

Preparer/Manager: Kevin Brown

Current Cost Est.(FY05 $M) $8.7

Assigned Contingency % 19%

Cost Elements (FY05 $M)

Matls	$3.9
Effort	$2.3
Ohd	$1.1
Conting	$1.4
Total	$8.7

WBS Dictionary Definition: AGS Modifications for RSVP: modifications to prevent RSVP from having an impact on RHIC operations, modifications to allow AGS to meet RSVP intensity and beam throughput requirements, and modifications to allow the AGS to remain maintainable throughout RSVP operations.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	x	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	20%	Engineered Design	14%
Engineered Conceptual	56%	Scientist Conceptual	10%
Guess	0%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: This is mostly repairs and improvements to existing designs. Some new designs are involved, such as a new Electrostatic septum for extraction. It includes new septa magnets for slow extraction, new power supplies for the new magnets, improvments to instrumentation, other infrastructure improvements to improve maintainability, and shield caps to prevent activated soil from contaminating ground water.

Issues (funding, collaborator shortage, engineering help, etc.): Does not include collimators for the AGS, an issue still being investigated. Also Shield caps are included entirely as a materials cost, since this work is mostly oustside contracted.

BOOSTER AGS MODIFICATIONS
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.1.4

Title: MECO AGS Mods

Preparer/Manager: Kevin Brown

Current Cost Est.(FY05 $M) $1.4

Assigned Contingency % 22%

Cost Elements (FY05 $M)

Matls	$0.500
Effort	$0.443
Ohd	$0.244
Conting	$0.209
Total	$1.4

WBS Dictionary Definition: AGS Modifications for MECO gap cleaning during bunched beam slow extraction. This includes a new AC dipole system and stripline kickers, which working together clean the gap between the main beam bunches in the AGS. Also included is simulations for MECO extraction.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	x	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	15%	Engineered Design	0%
Engineered Conceptual	0%	Scientist Conceptual	85%
Guess	0%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: Conceptual Design Only. Some aspects of system tested in accelerator studies.

Issues (funding, collaborator shortage, engineering help, etc.): Cost estimate calls for a new AC dipole magnet. Current thinking is a new magnet is not necessary. Cost estimate also assumes power amplifier for strip-line kickers is designed and built in house. Current thinking is this can be contracted outside.

BOOSTER AGS MODIFICATIONS
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.1.5

Title: KOPIO AGS Mods

Preparer/Manager: Kevin Brown

Current Cost Est.(FY05 $M) $5.2

Assigned Contingency % 21%

Cost Elements (FY05 $M)

Matls	$1.4
Effort	$2.1
Ohd	$1.0
Conting	$0.7
Total	$5.2

WBS Dictionary Definition: AGS Modifications for KOPIO. Includes AGS Injection kicker modifications to achieve higher intensity and two new AGS RF cavities that will be used to create the 200 psec micro-bunches for KOPIO.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	x	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	18%	Engineered Design	6%
Engineered Conceptual	34%	Scientist Conceptual	42%
Guess	0%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: Conceptual Design Only. Some aspects of system tested in accelerator studies. RHIC 28 MHz RF cavities considered as prototype for 25 MHz RF cavity.

Issues (funding, collaborator shortage, engineering help, etc.): Cost estimate calls for a 100 MHz RF Cavity. Whether or not this is needed will not be known until the 25 MHz RF cavity is built and tested with beam. Cost estimates assume majority of Kicker and 25 MHz cavity costs are covered by the Canadian Foundation for Innovation and managed by TRIUMF.

SWITCHYARD
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.2.1

Title: Project Support

Preparer/Manager: Al Pendzick

Current Cost Est.(FY05 $M) $0.3

Assigned Contingency % 16%

Cost Elements (FY05 $M)

Matls	$0.0
Effort	$0.2
Ohd	$0.1
Conting	$0.0
Total	$0.3

WBS Dictionary Definition:

Provides for overall Project support, co-ordination between technical groups, documentation, and installation supervision for modifications to the switchyard

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	0%	Engineered Design	0%
Engineered Conceptual	0%	Scientist Conceptual	0%
Guess	0%	Previous Proj.Support efforts	100%
		Total	100%

Status of Hardware/Software Development: NA

Issues (funding, collaborator shortage, engineering help, etc.): None

SWITCHYARD
RSVP Review Status Sheet

Date: 12/29/04

WBS No. 1.4.2.2

Title: Shielding Modifications

Preparer/Manager: Al Pendzick

Current Cost Est.(FY05 $M) $0.1

Assigned Contingency % 2200%

Cost Elements (FY05 $M)

Matls	$0.0
Effort	$0.0
Ohd	$0.0
Conting	$0.0
Total	$0.1

WBS Dictionary Definition: Provides for the modification of existing shielding in the switchyard in two areas: Steel shielding will be installed between the AGS ring & the switchyard hyard,allowing access to the switchyard while ions are circulating in the AGS ring. The downstream switchyard labyrinth will be modified to allow easy access to the switchyard

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	10%	Engineered Design	0%
Engineered Conceptual	85%	Scientist Conceptual	0%
Guess	5%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: N/A

Issues (funding, collaborator shortage, engineering help, etc.): None

SWITCHYARD
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.2.3

Title: Electrical Modifications

Preparer/Manager: Al Pendzick

Current Cost Est.(FY05 $M) $0.7

Assigned Contingency % 24%

Cost Elements (FY05 $M)

Matls	$0.2
Effort	$0.3
Ohd	$0.2
Conting	$0.1
Total	$0.7

WBS Dictionary Definition:
Provides for modifications to the existing 480V power distribution for power supplies to meet NEC code and redistributes power in the switchyard for new equipment. Modifies existing power supplies for a new control system and refurbishs them as needed.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	37%	Engineered Design	45%
Engineered Conceptual	13%	Scientist Conceptual	0%
Guess	5%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: The power modification uses standard commercial AC breakers installed in our existing distribution panels. The power supply modification uses commercial controllers interfaced with with existing AGS power supplies. This modification has been successfully completed for our most common power supply.

Issues (funding, collaborator shortage, engineering help, etc.): none

SWITCHYARD
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.2.4

Title: Mechanical Modifications

Preparer/Manager: Al Pendzick

Current Cost Est.(FY05 $M) $0.3

Assigned Contingency % 17%

Cost Elements (FY05 $M)

Matls	$0.1
Effort	$0.1
Ohd	$0.0
Conting	$0.0
Total	$0.3

WBS Dictionary Definition: Provides for two beam plugs & modifies 4 existing magnets for the new beam line. The beam plugs, together with WBS 1.4.2.2 will allow access to downstream radiation areas under certain machine ‹ ine operating conditions.Also provides for non-radioactive cooling water supply to water cooled power supplies.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	20%	Engineered Design	65%
Engineered Conceptual	12%	Scientist Conceptual	0%
Guess	3%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: Beam plug design is a copy of the NSRL beam plug. All the magnets are in excellent condition.

Issues (funding, collaborator shortage, engineering help, etc.): none

SWITCHYARD
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.2.5

Title: Installation

Preparer/Manager: Al Pendzick

Current Cost Est.(FY05 $M) $0.9

Assigned Contingency % 1940%

Cost Elements (FY05 $M)

Matls	$0.1
Effort	$0.5
Ohd	$0.2
Conting	$0.1
Total	$0.9

WBS Dictionary Definition: Provides for the removal of 22 magnets and the installation of 10 magnets and 2 beam plugs in the switchyard

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	5%	Engineered Design	0%
Engineered Conceptual	0%	Scientist Conceptual	0%
Guess	5%	Past Experience	90%
		Total	100%

Status of Hardware/Software Development: NA

Issues (funding, collaborator shortage, engineering help, etc.): none

SWITCHYARD
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.2.6

Title: Vacuum

Preparer/Manager: Al Pendzick

Current Cost Est.(FY05 $M) $0.5

Assigned Contingency % 24%

Cost Elements (FY05 $M)

Matls	$0.2
Effort	$0.2
Ohd	$0.1
Conting	$0.1
Total	$0.5

WBS Dictionary Definition: Provides for the design, fabrication and installation of a vacuum system in th the AGS ring, "A" line & "B" line and modifies the existing controls for these areas.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	20%	Engineered Design	0%
Engineered Conceptual	75%	Scientist Conceptual	0%
Guess	5%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: The vacuum pumps and hardware are commercially available. The control system needs only minor modifications

Issues (funding, collaborator shortage, engineering help, etc.): Not scrubbed

SWITCHYARD
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.2.7

Title: Conventional Modifications

Preparer/Manager: Al Pendzick

Current Cost Est.(FY05 $M) $0.1

Assigned Contingency % 17%

Cost Elements (FY05 $M)

Matls	$0.0
Effort	$0.0
Ohd	$0.0
Conting	$0.0
Total	$0.1

WBS Dictionary Definition: Provides a new enclosure for instrumentation and controls, fire detection, protection, and dehumidification of the Switchyard cave.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	35%	Engineered Design	0%
Engineered Conceptual	60%	Scientist Conceptual	0%
Guess	5%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: All of the hardware is commercially available

Issues (funding, collaborator shortage, engineering help, etc.): None

SWITCHYARD
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.2.8

Title: Instrumentation

Preparer/Manager: Al Pendzick

Current Cost Est.(FY05 $M) $1.2

Assigned Contingency % 20%

Cost Elements (FY05 $M)

Matls	$0.4
Effort	$0.4
Ohd	$0.3
Conting	$0.2
Total	$1.2

WBS Dictionary Definition: Provides for the relocation & upgrade of the existing switchyard instrumentation for the new RSVP beam transport. This includes an upgrade of the loss monitor system, EPM's, scanning target, C11 plunging SWIC, C10 SEM, and motion controls. A new current transformer will be installed at C36.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	50%	Engineered Design	20%
Engineered Conceptual	25%	Scientist Conceptual	0%
Guess	5%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: This is a straight-forward upgrade of existing technology except for the EPM's where some R&D is needed.

Issues (funding, collaborator shortage, engineering help, etc.): not scrubbed

SWITCHYARD
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.2.9

Title: Security Modifications

Preparer/Manager: Al Pendzick

Current Cost Est.(FY05 $M) $0.4

Assigned Contingency % 20%

Cost Elements (FY05 $M)

Matls	$0.1
Effort	$0.2
Ohd	$0.1
Conting	$0.0
Total	$0.4

WBS Dictionary Definition: Provides for a PLC based access control system for the 3 gates in the switchyard, similar to the NSRL system. This includes gates, key trees and iris scanner, CATV, chipmonks, crash and sweep stations.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	30%	Engineered Design	30%
Engineered Conceptual	35%	Scientist Conceptual	0%
Guess	5%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: Most of the hardware is commercially available. The software has not been developed but will be similar to the NSRL beam line software.

Issues (funding, collaborator shortage, engineering help, etc.): None

SWITCHYARD
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.2.10

Title: Computer Controls

Preparer/Manager: Al Pendzick

Current Cost Est.(FY05 $M) $0.3

Assigned Contingency % 23%

Cost Elements (FY05 $M)

Matls	$0.1
Effort	$0.1
Ohd	$0.0
Conting	$0.1
Total	$0.3

WBS Dictionary Definition:

All controls interface hardware fc or the switchyard magnet power supplies and t instrumentation will be procured, assembled, installed and tested. Standard software tools and database are configured, installed and tested.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	36%	Engineered Design	32%
Engineered Conceptual	30%	Scientist Conceptual	0%
Guess	2%	Other (specify)	
		Total	100%

Status of Hardware/Software Development:

No hardware development required. Use of standard RHIC controls elements. Software development is limited to configuring and installing standard components and creating database elements for new modules.

Issues (funding, collaborator shortage, engineering help, etc.):

This WBS has not been scrubbed.

SWITCHYARD
RSVP Review Status Sheet

Date: 12/29/04 12:00 AM

WBS No. 1.4.2.11

Title: NASA Relocation

Preparer/Manager: Al Pendzick

Current Cost Est.(FY05 $M) $0.1

Assigned Contingency % 22%

Cost Elements (FY05 $M)

Matls	$0.0
Effort	$0.1
Ohd	$0.0
Conting	$0.0
Total	$0.1

WBS Dictionary Definition: Provides for the relocation of the NASA experimental area, instrumentation and control trailer from the A-3 line to the switchyard

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	10%	Engineered Design	65%
Engineered Conceptual	20%	Scientist Conceptual	0%
Guess	5%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development: Most of the existing hardware will be relocated, the remaining equipment is commercially available.

Issues (funding, collaborator shortage, engineering help, etc.): The proposed position in the switchyard requires installation/removal of the "B" line vacuum. This will add an additional radiation burden for operations and experimental personnel.

KOPIO
RSVP Review Status Sheet

Date: January 13, 2005

WBS No.	1.4.3	**Title: KOPIO**	
Preparer/Manager:	C Pearson	**Current Cost Estimate (FY05 $M)**	$11.63
		Assigned Contingency	27%

Cost Elements (FY05 $M)

Materials	$ 3.77
Effort	$ 3.62
Overhead	$ 1.98
Contingency	$ 2.26
Total	**$ 11.63**

WBS Dictionary Definition:
Provides the ‘B’-line beam transport from the AGS Switchyard to the KOPIO proton target, the KOPIO neutral beam, and the general infrastructure needs for the KOPIO experimental area.

KOPIO
RSVP Review Status Sheet

Date: January 13, 2005

WBS No. 1.4.3.1 **Title: Project Support and Integration**
Preparer/Manager: C Pearson **Current Cost Estimate (FY05 $M)** $1.99
Assigned Contingency 16.4 %

Cost Elements (FY05 $M)

Materials	-
Effort	$ 1.22
Overhead	$ 0.57
Contingency	$ 0.2
Total	**$ 1.99**

WBS Dictionary Definition:
Provides for overall project support by a liaison engineer and liaison physicist.
Provides general engineering and technical supervision support for instrumentation, controls, and security systems
Provides general design and documentation support.
Provides C-AD construction supervision.

Technical Level of Confidence:

Prototype Demonstrated		Elements built & tested	
Similar system exists	X	Similar Technology works	
Novel system concept		No candidate concept yet	
Other (see comments)			

Comment(s):

Basis of the Cost Estimate: (by percentage of total cost)

Commercial product		Engineered design	
Engineered conceptual		Scientist conceptual	
Guess		Other (see comments)	100%
		Total	100%

Comment(s): Previous project support experience

Status of Hardware/Software Development: Not applicable

Issues (funding, collaborator shortage, engineering help, etc.): None

KOPIO
RSVP Review Status Sheet

Date: January 13, 2005

WBS No.	1.4.3.2	**Title: Primary Beam**	
Preparer/Manager:	C Pearson	**Current Cost Estimate (FY05 $M)**	$2.78
		Assigned Contingency	18.5%

Cost Elements (FY05 $M)

Materials	$ 0.66
Effort	$ 1.2
Overhead	$ 0.57
Contingency	$ 0.35

Total	**$ 2.78**

WBS Dictionary Definition:
Provides for labor and materials required to construct the proton transport beam for the KOPIO experiment. This effort starts at the exit of the AGS switchyard and ends at the KOPIO proton target.
The existing equipment in the 'B' lines and 'C' lines will be removed and shielding reconfigured. Nine existing magnets and power supplies will be prepared and installed. New beam instrumentation and a new vacuum system will be fabricated and installed.

Technical Level of Confidence:

Prototype Demonstrated		Elements built & tested
Similar system exists	X	Similar Technology works
Novel system concept		No candidate concept yet
Other (see comments)		

Comment(s):

Basis of the Cost Estimate: (by percentage of total cost)

Commercial product	20%	Engineered design	35%
Engineered conceptual	20%	Scientist conceptual	15%
Guess	10%	Other (see comments)	
		Total	100%

Comment(s):

Status of Hardware/Software Development:
Magnets and power supplies are available from C-A inventory
Most radiation shielding is available from C-A inventory

Issues (funding, collaborator shortage, engineering help, etc.):

- Beam transport design is preliminary. Actual design may require additional beam elements
- Beam instrumentation requirements need scrubbing
- Proton target position is influenced by experimental requirements such as production angle, neutral beam size, experimental area size, and experimental shielding requirements.
- Proton beam dump position and design needs further study to minimize experimental background

.

KOPIO
RSVP Review Status Sheet

Date: January 13, 2005

WBS No.	1.4.3.3	**Title: Common Equipment/Facilities**	
Preparer/Manager:	C Pearson	**Current Cost Estimate (FY05 $M)**	$0.671
		Assigned Contingency	22%

Cost Elements (FY05 $M)

Materials	$ 0.273
Effort	$ 0.169
Overhead	$ 0.132
Contingency	$ 0.097

Total	**$ 0.671**

WBS Dictionary Definition:
Provides labor and materials required to provide equipment common to more than one WBS area and general facilities related upgrades.
The existing Cooling Tower #2 system will be upgraded to provide cooling water for the Neutral beam and experimental area pump skids.
A PLC- based magnet interlock system will be fabricated for the primary beam, neutral beam, and experimental sweeper.
Bldg 912 roof vents will be replaced and sealed.
The EEBA crane will be modified for operation with a radio control system.
All controls interface hardware for the KOPIO beamline magnet power supplies and beam instrumentation will be provided.
An enclosure will be constructed to provide protection/climate control for the controls and instrumentation electronics.

Technical Level of Confidence:

Prototype Demonstrated		Elements built & tested
Similar system exists	X	Similar Technology works
Novel system concept		No candidate concept yet
Other (see comments)		

Comment(s):

Basis of the Cost Estimate: (by percentage of total cost)

Commercial product	50%	Engineered design	30%
Engineered conceptual	10%	Scientist conceptual	
Guess	10%	Other (see comments)	
		Total	100%

Comment(s):

Status of Hardware/Software Development:
Cooling Tower #2 systems and distribution piping exists.
Many PLC-based magnet interlock system are utilized by C-A.

Issues (funding, collaborator shortage, engineering help, etc.):
None

KOPIO
RSVP Review Status Sheet

Date: January 13, 2005

WBS No.	1.4.3.4	**Title: B-Line Security System Mods.**	
Preparer/Manager:	C Pearson	**Current Cost Estimate (FY05 $M)**	$0.486
		Assigned Contingency	19.8%

Cost Elements (FY05 $M)

Materials	$ 0.092
Effort	$ 0.221
Overhead	$ 0.111
Contingency	$ .062
Total	**$ 0.486**

WBS Dictionary Definition:
Personnel access system for the beam cave and experimental area. The system is PLC-based and modeled after the existing NSRL system.

Technical Level of Confidence:

Prototype Demonstrated		Elements built & tested
Similar system exists	X	Similar Technology works
Novel system concept		No candidate concept yet
Other (see comments)		

Comment(s):

Basis of the Cost Estimate: (by percentage of total cost)

Commercial product	30%	Engineered design	30%
Engineered conceptual	40%	Scientist conceptual	
Guess	5%	Other (see comments)	
		Total	100%

Comment(s):

Status of Hardware/Software Development:
Most of the hardware is commercially available. The software has not been developed but will be similar to the NSRL beam line software.

Issues (funding, collaborator shortage, engineering help, etc.):
None

KOPIO
RSVP Review Status Sheet

Date: January 13, 2005

WBS No.	1.4.3.5	**Title: Neutral Beam**	
Preparer/Manager:	C Pearson	**Current Cost Estimate (FY05 $M)**	$3.82
		Assigned Contingency	37%

Cost Elements (FY05 $M)

Materials	$ 1.78
Effort	$ 0.58
Overhead	$ 0.59
Contingency	$ 0.87
Total	**$ 3.82**

WBS Dictionary Definition:
Provides the labor and materials required to fabricate and install the KOPIO neutral beam.
The neutral beam includes the proton beam target, 3 sweeping magnets, a collimator system, vacuum chamber, and shielding.
Two pump skids will be fabricated to provide closed loop cooling water to the proton target, sweeping magnets, and experimental equipment.

Technical Level of Confidence:

Prototype Demonstrated		Elements built & tested	
Similar system exists		Similar Technology works	
Novel system concept		No candidate concept yet	
Other (see comments)	X		

Comment(s): By component parts similar systems exists. Integrated design is Conceptual and challenging

Basis of the Cost Estimate: (by percentage of total cost)

Commercial product		Engineered design	
Engineered conceptual	25%	Scientist conceptual	50%
Guess	25%	Other (see comments)	
		Total	100%

Comment(s):

Status of Hardware/Software Development:
The proposed proton target is based on a Triumph design. Preliminary thermal calculations have been completed.
Preliminary engineering designs have been completed for the 3 sweeping magnets.
D1 magnet is a radiation-hard design developed at C-A for the SNS Project.

Issues (funding, collaborator shortage, engineering help, etc.):
- Baselining the parameters for the proton beam and neutral beam requirements is required to proceed to a final design effort
- Shielding requirements need further study
- Collimator geometry and alignment tolerances need further study
- Sweeping magnet designs need to be optimized for cost and compatibility with existing C-A power supplies
- After KOPIO baselining, a six month preliminary design effort by C-A is required. This effort will integrate the technical design issues for the production target, neutral beam, and experimental area. The design effort will provide the basis for detailed engineering and design.

KOPIO
RSVP Review Status Sheet

Date: January 13, 2005

WBS No.	1.4.3.5	**Title: Neutral Beam**	
Preparer/Manager:	C Pearson	**Current Cost Estimate (FY05 $M)**	$3.82
		Assigned Contingency	37%

Cost Elements (FY05 $M)

Materials	$ 1.78
Effort	$ 0.58
Overhead	$ 0.59
Contingency	$ 0.87
Total	**$ 3.82**

WBS Dictionary Definition:
Provides the labor and materials required to fabricate and install the KOPIO neutral beam.
The neutral beam includes the proton beam target, 3 sweeping magnets, a collimator system, vacuum chamber, and shielding.
Two pump skids will be fabricated to provide closed loop cooling water to the proton target, sweeping magnets, and experimental equipment.

Technical Level of Confidence:

Prototype Demonstrated		Elements built & tested
Similar system exists		Similar Technology works
Novel system concept		No candidate concept yet
Other (see comments)	X	

Comment(s): By component parts similar systems exists. Integrated design is Conceptual and challenging

Basis of the Cost Estimate: (by percentage of total cost)

Commercial product		Engineered design	
Engineered conceptual	25%	Scientist conceptual	50%
Guess	25%	Other (see comments)	
		Total	100%

Comment(s):

Status of Hardware/Software Development:
The proposed proton target is based on a Triumph design. Preliminary thermal calculations have been completed.
Preliminary engineering designs have been completed for the 3 sweeping magnets.
D1 magnet is a radiation-hard design developed at C-A for the SNS Project.

Issues (funding, collaborator shortage, engineering help, etc.):
- Baselining the parameters for the proton beam and neutral beam requirements is required to proceed to a final design effort
- Shielding requirements need further study
- Collimator geometry and alignment tolerances need further study
- Sweeping magnet designs need to be optimized for cost and compatibility with existing C-A power supplies
- After KOPIO baselining, a six month preliminary design effort by C-A is required. This effort will integrate the technical design issues for the production target, neutral beam, and experimental area. The design effort will provide the basis for detailed engineering and design.

MECO
RSVP Review Status Sheet

Date: 1/13/05

WBS No. 1.4.4

Title: MECO

Preparer/Manager: Dave Phillips

Current Cost Est.(FY05 $M) $12.0

Assigned Contingency % 23.4%

Cost Elements (FY05 $M)

Matls	$2.8
Effort	$4.8
Ohd	$2.5
Conting	$1.8
Total	$12.0

WBS Dictionary Definition:
Beamline transport from the Switchyard to MECO and the experimental requirements for MECO which are C-AD responsibility. This includes project support, the proton beamline, instrumentation, security, controls and experimental requirements.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	16%	Engineered Design	18%
Engineered Conceptual	31%	Scientist Conceptual	10%
Guess	5%	Other (specify)	20%
		Total	100%

Status of Hardware/Software Development:

Issues (funding, collaborator shortage, engineering help, etc.):
Scope of C-AD Solenoid & Cryo Support may change due to recommendations of the Magnet Oversight Group

MECO
RSVP Review Status Sheet

Date: 1/13/05

WBS No. 1.4.4.1

Title: Project Support & Integration

Preparer/Manager: Dave Phillips

Current Cost Est.(FY05 $M) $2.21

Assigned Contingency % 16.0%

Cost Elements (FY05 $M)

Matls	$0.00
Effort	$1.36
Ohd	$0.63
Conting	$0.22
Total	$2.21

WBS Dictionary Definition:
Provides for overall project support for the design, fabrication and installation of the C-AD portion of MECO. Coordination is provided between the MECO experiment, technical, administrative & safety groups at C-AD, Safety Committees at C-AD, BNL Central Shops & Plant Engineering and outside vendors & contractors. Technical supervision for C-AD employees. Documentation of the overall layout of the A-Line and MECO Experiment in Building 912. Project support includes the Liaison Engineer & Liaison Physicist for the overall project as well as project support for Beamline Design, Instrumentation, Security and Controls.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	0%	Engineered Design	0%
Engineered Conceptual	0%	Scientist Conceptual	0%
Guess	0%	Previous Proj.Support efforts	100%
		Total	100%

Status of Hardware/Software Development:

Issues (funding, collaborator shortage, engineering help, etc.):

MECO
RSVP Review Status Sheet

Date: 1/13/05

WBS No. 1.4.4.2

Title: MECO Proton Beamline

Preparer/Manager: Dave Phillips

Current Cost Est.(FY05 $M) $5.60

Assigned Contingency % 24.4%

Cost Elements (FY05 $M)

Matls	$1.44
Effort	$2.25
Ohd	$1.01
Conting	$0.90
Total	$5.60

WBS Dictionary Definition:
Design, fabrication and installation of the A-Line transport system for the delivery of the primary beam from the Switchyard to MECO. The existing A-Line and the part of the D-Line will be cleared of existing equipment. New shielding for the Transport Solenoid and Cosmic Ray Shield will be purchased. The 480V power distribution system and controls for magnet power supplies will be updated. The primary transport will have 16 refurbished magnets from existing inventory and 2 new magnets will be designed and built. The vacuum system includes costs for a section of high vacuum for the RFMM, the downstream vacuum closure for the Production Solenoid (PS) and a Helium box between the PS and the beam dump. ODH and fire detection systems will be installed. Facility improvements include Bldg 912 roof repairs (vent fans not covered by preventive plant project maintenance by BNL) and enclosures for instrumentation, controls and RFMM.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	20%	Engineered Design	20%
Engineered Conceptual	40%	Scientist Conceptual	15%
Guess	5%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development:
Most equipment for MECO Proton Beamline either exists or is similar to an existing design. Relatively minor exceptions are the Production Solenoid vacuum end cap and the use of bulk zinc shielding as a cost effective non-magnetic radiation shielding for the Transport Solenoid and the Cosmic Ray Shield.

Issues (funding, collaborator shortage, engineering help, etc.):
1) Using shielding from inventory for the Cosmic Ray Shield is a potential cost savings which requires rigging to locate shield blocks with "low" activation levels.
2) The design of beam pitching onto the target needs to be completed, this could increase costs if collimation & shielding are more involved than assumed and it can decrease costs if the new pitching magnets can be replaced with magnets from inventory.
3) The need for ODH detection in the beam cave may be eliminated if the design of the Production Solenoid is changed from bath cooling to conduction cooling.
4) Interfaces with the RFMM need to be better defined.

MECO
RSVP Review Status Sheet

Date: 1/13/05

WBS No. 1.4.4.3

Title: MECO Instrumentation

Preparer/Manager: Dave Phillips

Current Cost Est.(FY05 $M) $1.32

Assigned Contingency % 21.6%

Cost Elements (FY05 $M)

Matls	$0.48
Effort	$0.37
Ohd	$0.28
Conting	$0.18
Total	$1.32

WBS Dictionary Definition:
Instrumentation for the delivery of the proton beam from Switchyard to the Production Target and to monitor targeting efficiency. Beamline instrumentation includes EPM's (4), current transformers (2), beam position monitors (4), loss monitors and collimator motion control. Target monitoring devices are pin diodes (10), target flag, target telescope and target temperature monitor.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	30%	Engineered Design	30%
Engineered Conceptual	20%	Scientist Conceptual	15%
Guess	5%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development:
Beamline instrumentation is similar to existing designs.

Issues (funding, collaborator shortage, engineering help, etc.):
1) Target monitoring is a challenge due to the location of the target inside the Production Solenoid.
2) Extinction confirmation using current transformers will need special electronics.
3) MECO instrumentation needs to be scrubbed for both scope and cost.

MECO
RSVP Review Status Sheet

Date: 1/13/05

WBS No. 1.4.4.4

Title: MECO Security

Preparer/Manager: Dave Phillips

Current Cost Est.(FY05 $M) $0.44

Assigned Contingency % 20.2%

Cost Elements (FY05 $M)

Matls	$0.07
Effort	$0.21
Ohd	$0.11
Conting	$0.06
Total	$0.44

WBS Dictionary Definition:
Personnel access system to beam and experimental cave. The system is PLC based modeled after the NASA system.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	25%	Engineered Design	30%
Engineered Conceptual	40%	Scientist Conceptual	5%
Guess	0%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development:
Most of the hardware is commercially available. The software has not been developed but will be similar to the NSRL beam line software.

Issues (funding, collaborator shortage, engineering help, etc.): None

MECO
RSVP Review Status Sheet

Date: 1/13/05

WBS No. 1.4.4.5

Title: MECO Controls

Preparer/Manager: Dave Phillips

Current Cost Est.(FY05 $M) $0.31

Assigned Contingency % 24.1%

Cost Elements (FY05 $M)

Matls	$0.13
Effort	$0.07
Ohd	$0.06
Conting	$0.05
Total	$0.31

WBS Dictionary Definition:
All controls interface hardware for the MECO beamline magnet power supplies and beam instrumentation will be specified, procured, assembled, installed and tested. Standard software tools and database will be configured, installed and tested.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	X	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	43%	Engineered Design	22%
Engineered Conceptual	33%	Scientist Conceptual	0%
Guess	2%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development:
No hardware development required. Use of standard RHIC controls elements. Software development is limited to configuring and installing standard components and creating database elements for new modules.

Issues (funding, collaborator shortage, engineering help, etc.):
This WBS needs scrubbing.

MECO
RSVP Review Status Sheet

Date: 1/13/05

WBS No. 1.4.4.6

Title: MECO Experiment

Preparer/Manager: Dave Phillips

Current Cost Est.(FY05 $M) $2.08

Assigned Contingency % 30.2%

Cost Elements (FY05 $M)

Matls	$0.70
Effort	$0.58
Ohd	$0.41
Conting	$0.39
Total	$2.08

WBS Dictionary Definition:
MECO Experiment areas which are C-AD responsibility are the Target System, Solenoid Support, and Experimental Infrastructure. The Target System includes verification of the UCI target design, proto type testing & fabrication, storage & handling design, testing & fabrication, and cooling system design & fabrication. Solenoid support includes MDMG Support, facility infrastructure for the installation of the solenoids & cryogenic system, integration of the cryogenic system with C-AD operations, and installation & hook-up of the solenoid power supplies. Experimental Infrastructure includes electric power & tray, an Electronics Hut, a new Counting House, an Experimental Safety System, and a Clean Room.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists		Similar Technology Works	X
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	10%	Engineered Design	20%
Engineered Conceptual	50%	Scientist Conceptual	10%
Guess	10%	Other (specify)	0%
		Total	100%

Status of Hardware/Software Development:
Production Target design at UCI has shown that a water cooled target is feasible.

Issues (funding, collaborator shortage, engineering help, etc.):
1) This plan assumes the Solenoid System is procured turn Key, C-AD's responsibility for the Solenoid System may change depending on final procurement method. The current plan has, for the most part, the minimal amount of work assigned to C-AD.

2) This WBS needs scrubbing.

AGS Project Office
RSVP Review Status Sheet

Date: 14-Jan-05

WBS No. 1.4.5

Title: AGS Project Office

Preparer/Manager: P. Pile

Current Cost Est.(FY05 $M) $2.80

Assigned Contingency % 20%

Cost Elements (FY05 $M) assumes a 5 year construction effort

Effort	$1.57
Matls	$0.11
Ohd	$0.78
Conting	$0.34
Total	$2.80

WBS Dictionary Definition: This WBS contains the effort associated with the project office at BNL for RSVP Booster, AGS, Switchyard, primary beam lines, experimental areas and the K0PI0 neutral beam. The effort includes the project manager and deputy, mechanical and electrical system managers, project controls, installation and conventional facilities coordination, QA and ES&H and financial oversight. This staff responds to all requests from the RSVP Project Office

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	x	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	0%	Engineered Design	0%
Engineered Conceptual	0%	Scientist Conceptual	0%
Guess	10%	Known Personnel Costs	90%
		Total	100%

Status of Hardware/Software Development:
Microsoft Excel and Project software in hand, RSVP specific Microsoft Access data base program now available

Issues (funding, collaborator shortage, engineering help, etc.):
- The resource needs for this office must be coordinated with what's available in the RSVP Project Office
- A good direct line of communications with RSVP Project Office exists but there’s an abundance of managers above the AGS Project Office, leads to lack of timely guidance
- The RSVP Project Office has yet to provide a PMP or PEP
- Imminent loss of the MECO Project Manager
- Insufficient budget for work to be done this year (plan to use K0PI0 and MECO funds as required once Project Office funds are exhausted to complete base-line work)
- Personnel – balancing RHIC and RSVP needs, March 2005 C-AD RIF, many new hires needed for project start

Beam Development
RSVP Review Status Sheet

Date: 13-Jan-05

WBS No. 1.4.1.6

Title: Beam Development

Preparer/Manager: P. Pile/L. Ahrens

Current Cost Est.(FY05 $M) $14.35

Assigned Contingency % 0%

Cost Elements (FY05 $M) assumes a 5 year construction effort

Effort	$4.78
Matls	$4.17
Ohd	$2.70
Power	$2.69
Conting	$0.00
Total	$14.35

WBS Dictionary Definition: This effort provides resources to develop AGS beams to match experiment requirements. Resources include a 14 FTE supplement to current RHIC operations and support personnel as well as covers incremental costs for power, materials and laboratory distributed technical services. This does not supply sufficient resources for full operation of experiments.

Technical Level of Confidence: (choose one)

Prototype Demonstrated		Elements Built & Tested	
Similar System Exists	x	Similar Technology Works	
Novel System Concept		No Candidate Concept Yet	
Other (Comment)			

Basis of the Cost Estimate: (by percentage of total cost: sum of fractions = 100%)

Commercial Product	0%	Engineered Design	0%
Engineered Conceptual	0%	Past AGS SEB costs	50%
Guess	20%	Known Personnel Costs	30%
		Total	100%

Status of Hardware/Software Development:

(1) AGS/Booster not ready for high intensity operation, component repair/replacement, radiation caps needed - 2-3 years of work

(2) K0PI0 (25 MHZ) and MECO specific modifications to the AGS should be available in third year of RSVP construction (1st year of beam development). K0pi) 100 MHz cavity available later (if needed).

Issues (funding, collaborator shortage, engineering help, etc.):

- Overall plan integrating machine and experiment needs is still being developed - some things will likely not be done during the 3 year development time and will have be done during physics operations period.
- K0PI0 beam intensity/spill is ~40% above previously achieved.
- MECO beam intensity per AGS RF bucket is ~100% above previously achieved levels and protons/second is ~100% above present AGS/Booster ALARA limits (component activation issue).
- Both experiments require special beam bunching with between bunch extinction requirements that may be difficult to achieve, especially with high intensity.